

Open **Linked Data**

meets

Open **Linked Interaction**



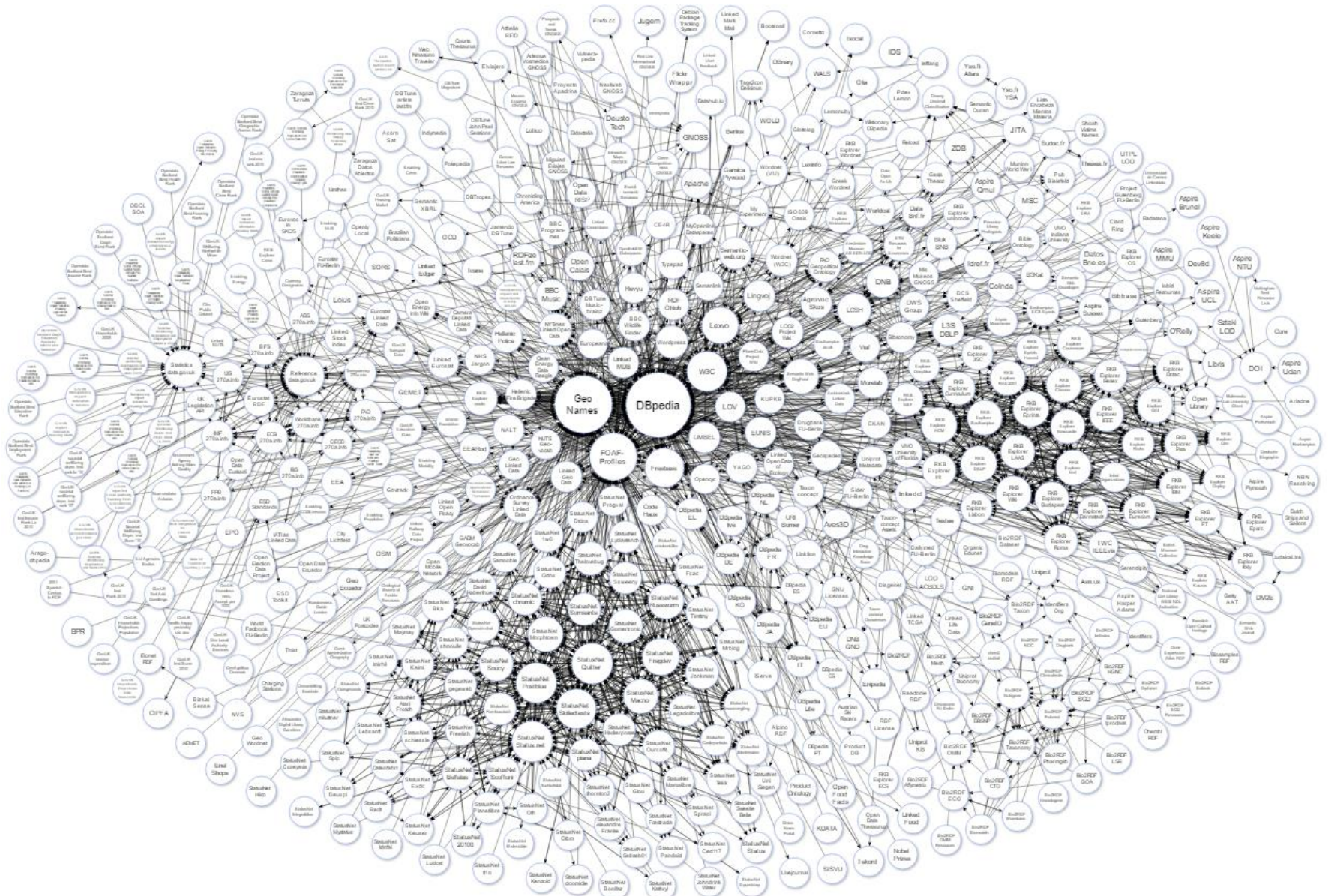
December 2nd 2016
Waternet, Amsterdam

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There is a massive amount of Linked Data



**So why isn't there
massive usage?**

subject	predicate	object
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	For centuries China stood as a leading civilization, outpacin
https://www.cia.gov/cia/publications/factbook/geos/ch.html	http://www4.wiwiss.fu-berlin.de/factbook/	http://www4.wiwiss.fu-berlin.de/factbook/resource/China
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	mostly mountains, high plateaus, deserts in west; plains, d
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	23 provinces (sheng, singular and plural), 5 autonomous re
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	UTC 8 (13 hours ahead of Washington, DC during Standard
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	extremely diverse; tropical in south to subarctic in north
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	14500
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	calendar year
https://www.cia.gov/library/publications/the-world-factbook	http://www4.wiwiss.fu-berlin.de/factbook/	http://www4.wiwiss.fu-berlin.de/factbook/resource/China
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	232780
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	2
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	777900000000
http://www4.wiwiss.fu-berlin.de/factbook	http://www.gounitive.com/uri/a/data_sour	http://www4.wiwiss.fu-berlin.de/factbook/resource/China
http://dbpedia.org/resource/China	http://www.gounitive.com/uri/a/same_as	http://www4.wiwiss.fu-berlin.de/factbook/resource/China
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	24.47
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	20.01
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	22.12
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	1.5
http://www4.wiwiss.fu-berlin.de/factbook/resource/China	http://www4.wiwiss.fu-berlin.de/factbook/	.cn
https://www.cia.gov/library/publications/the-world-factbook	http://www.gounitive.com/uri/a/depiction	http://www4.wiwiss.fu-berlin.de/factbook/resource/China
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Should we all **just keep sharing**
more and more data?

**Or should we also build interaction
to actually support usage of all that data?**

The Linked Data User Interaction Problem

Interaction with Linked Data

“Numerous challenges *remain in*
understanding appropriate
user interaction paradigms
for applications built
on data assembled dynamically”

Christian Bizer / Tom Heath / Tim Berners Lee

in: Linked Data - The Story So Far - 2009

Interaction with Linked Data

User Interaction *is one of the
most important things
on the to do List
for Linked Data*

Prof. Frank van Harmelen

at: The Linked Data Symposium Eindhoven - 2016

**So what is the
problem?**

Interaction with Linked Data



Why **fundamentally** different?

Where we come from

← Fixed Domain of Properties →

Name	Price	Size	Resolution	Display Technology	Refresh Rate
Philips 32PFK5300	€269	32 inch	1080 p	LED-LCD	50 HZ
Philips 40PFK5300	€379	40 inch	1080 p	LED-LCD	50 HZ
Philips 40PFK4100	€329	40 inch	1080 p	LED-LCD	50 HZ
Philips 48PUS7600	€799	48 inch	4K	LED-LCD	100 HZ
Philips 50PFK5300	€549	50 inch	1080 p	LED-LCD	50 HZ
Philips 32PFK5500	€319	32 inch	1080 p	LED-LCD	50 HZ
LG 42LF580V	€347	42 inch	1080 p	LED-LCD	50 HZ



Open ended in 1 dimension

Name	Price	Size	Resolution	Display Technology	Refresh Rate
Philips 40PFK4100	€329	40 inch	1080 p	LED-LCD	50 HZ
Philips 48PUS7600	€799	48 inch	4K	LED-LCD	100 HZ
Philips 50PFK5300	€549	50 inch	1080 p	LED-LCD	50 HZ
Philips 32PFK5500	€319	32 inch	1080 p	LED-LCD	50 HZ
LG 42LF580V	€347	42 inch	1080 p	LED-LCD	50 HZ

PHILIPS 32PFK5500 €319

★★★★☆ 13 reviews



Display Technology	LED-LCD
Size	32 inch
Resolution	1080 p
Wifi	✓
Refresh Rate	50 HZ
Weight	5,2 kg
Color	Black

[More details](#)

Linked Data is very dynamic

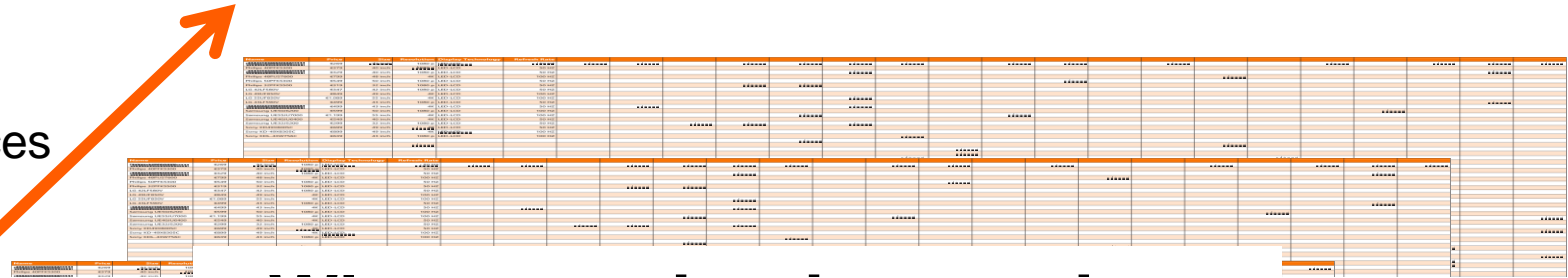
Subject	Predicate	Object
http://gounitive.com/productsample/16354821	http://purl.org/goodrelations/v1#name	Philips 32PFK5300
http://gounitive.com/productsample/16354821	http://purl.org/goodrelations/v1#hasCurrencyValue	269
http://gounitive.com/productsample/16354821	http://purl.org/goodrelations/v1#hasCurrency	Euro
http://gounitive.com/productsample/16354821	http://purl.org/goodrelations/v1#SizeValue	32
http://gounitive.com/productsample/16354821	http://purl.org/goodrelations/v1#SizeUnitOfMeasurement	inch
http://gounitive.com/productsample/16354821	http://purl.org/goodrelations/v1#ProductDimensions	28.9 x 3.9 x 17.6



Properties can be added at will

.. and can be different for each and every instance

Sources



A large table with multiple columns and rows, representing a data source. An orange arrow points from the word 'Sources' to the top-left corner of the table.

Linked Data is open ended in multiple dimensions
what data will be available



A large table with multiple columns and rows, representing a data source. An orange arrow points from the word 'Instances' to the bottom-left corner of the table.

Properties

Instances



That is ...

**Our current
user interaction paradigm
works with a fixed view on data**

**It cannot handle
the dynamic nature of linked data**

The Linked Data Interaction Problem

*“Numerous challenges remain in
understanding appropriate
user interaction paradigms
for applications built
on data **assembled dynamically**”*

Christian Bizer / Tom Heath / Tim Berners Lee

in: Linked Data - The Story So Far - 2009

Interaction with Linked Data– Current Solutions 1



Make user interaction generic


Organized for use case

Open



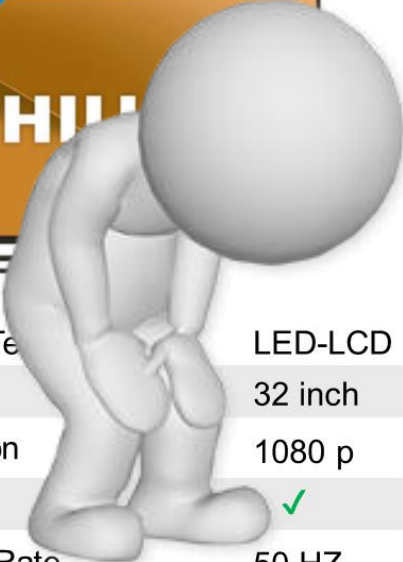
PHILIPS 32PFK5500 €319

★★★★☆ 13 reviews



32" 81 cm

PHILIPS



Display Technology	LED-LCD
Size	32 inch
Resolution	1080 p
Wifi	✓
Refresh Rate	50 HZ
Weight	5,2 kg
Color	Black

[More details](#)

en

[/www.w3.org/2000/10/swap/pim/contact#Male](#)

Berners-Lee

Berners-Lee (also at [www4.wiwiiss.fu-berlin.de](#))



ded
ata

[/www.w3.org/People/Berners-Lee/](#)

Berners-Lee

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Berners Lee

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ers-Lee

47c5a70db7407210cef8e4e6f5374a525c5c

[/www.w3.org/](#)

gh

will **never** gain
popular usage

Organizes information

- making **specific** selections
- using visual cues
- Unorganized

openic

is primary topic of

knows

[g/People/Berners-Lee/](#)

• [http://en.wikipedia.org/wiki/Tim_Berners-Lee](#)

• [Coralie Mercier](#)

Interaction with Linked Data– Current Solutions 2

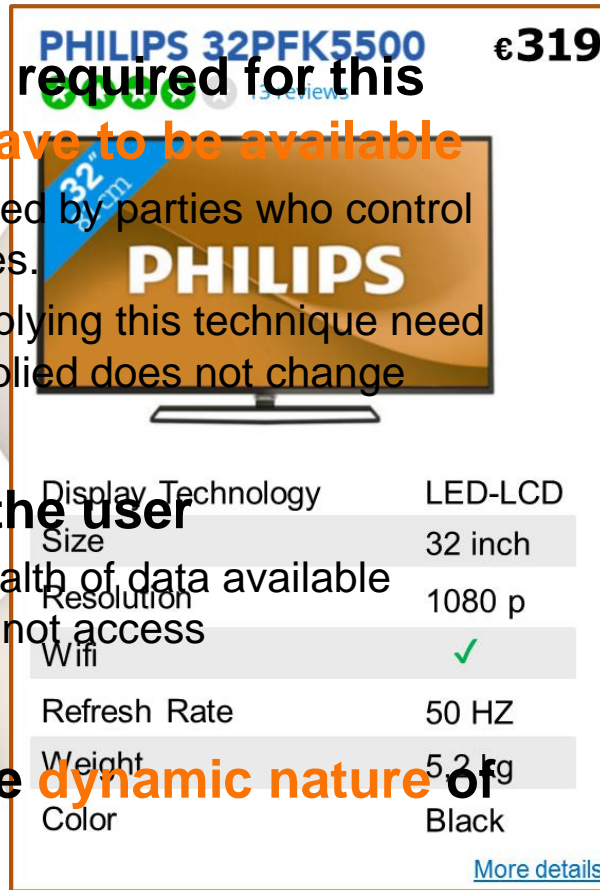
- The specific data required for this design doesn't have to be available

- Therefore mainly used by parties who control the data themselves.
- Outside parties applying this technique need trust that data supplied does not change

- Very limiting for the user

- There can be a wealth of data available which the user cannot access

- Abnegation of the dynamic nature of Linked Data



PHILIPS 32PFK5500 €319

32" LED-LCD

PHILIPS

Display Technology	LED-LCD
Size	32 inch
Resolution	1080 p
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Color	Black

[More details](#)



Keep user interaction specific
Use just a part of the data

What kind of user interaction paradigm

can support the full flexibility of linked data

**We need an answer to
a crucial question**

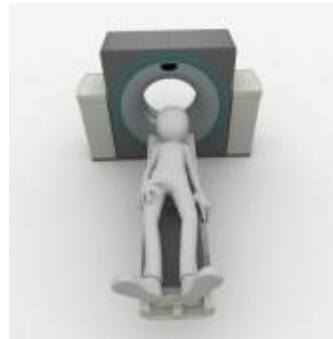
...

can offer a well designed and organized user interface?

AND ..



can support **different use cases**



We need **personalization**

AND ..



allows sharing and reuse of interaction

User Interaction Paradigm Requirements

- ☐ Can give user **full access** to Linked Data
- ☐ Can offer a **well designed** and **organized** user interface
- ☐ Supports **personalization**
- ☐ Allows **sharing / reuse**

User Interaction Paradigm Requirements

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**Our solution is surprisingly simple
but does offer this all**

So what is our solution?



Our solution: **Open Linked Interaction**

- **Make which interaction unit can be used open ended as well**
- Use optimizer to determine which unit is used
- Allow user to use a different unit
- Use feedback loop to improve optimizer

Make **which interaction unit** can be used
open ended as well

Make **which interaction unit** can be used
open ended as well

Interaction
units

Lucas Rodrigues Moura da Silva

Transfer news



Sky Sports News HQ

BREAKING: Sky Sources: Leicester close to signing Winger Lucas Mouro from Paris Saint-Germain. #SSNHQ

11:46 PM - 13 Aug 2015



Sport Witness



Lucas Rodrigues Moura da Silva

videos



Lucas Moura vs Chelsea FC (25/07/15) HD 720p by Yan van LucasMoura7x
2 weken geleden • 9.902 weergaven
International Champions Cup 2015 PSG 5-6 Chelsea FC (25.07.15) Song: Zao Samuel
- Set Out Your Loving Download Link: ...



Lucas Moura • Amazing Skills Show • 2014/15 [HD] van FootballTV



Lucas Rodrigues Moura da Silva



Right winger

Through balls
Key passes
Dribbling
Taking set-pieces
Passing
Crossing
Holding on to the ball
Finishing



Likes to dribble
Likes to play short passes
Likes to do layoffs
Gets fouled often



🇧🇷 ~ 22yrs ~ 1.72m ~ right footed ~ £ 22.40m (est.)

These can be
specific or **generic**

Make **which interaction unit** can be used **open ended** as well

Lucas Rodrigues Moura da Silva

Transfer news

 **Sky Sports News HQ**

BREAKING: Sky Sources: Leicester close to signing Winger Lucas Mouro from Paris Saint-Germain. #SSNHQ

11:46 PM - 13 Aug 2015

 **Sport Witness**

Marca say Lucas to Arsenal would be a 'tragedy' for Paris Saint-Germain and the idea has 'caused an earthquake' at the France club.

8:16 AM - 14 Aug 2015



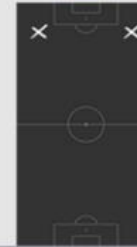


**Specify for each unit the
class/property requirements
a unit can be used**

Like a data contract

- **U**
- **A**
- **U**

 ~ 22yrs ~ 1.72m ~ right footed ~ £ 22.40m (est.)



Lucas Moura • Amazing Skills Show • 2014/15 [HD]
van FootballTV
9 maanden geleden • 169.082 weergaven
Leave a like or a comment if you enjoyed the video Follow Me:
<https://twitter.com/killervut> <https://www.facebook.com/FootballTV776>



Lucas Moura vs Chelsea FC (25/07/15) HD 720p by Yan
van LucasMoura7x
2 weken geleden • 9.902 weergaven
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Optimizer can be fed with

- **Data / Meta data**
- **Actual usage** of a unit
- **Progress made** (for instance in education)
- **Sales** numbers
- **Whether user continues** within some process
- **Combination** of the above

Interaction unit can be reused

GoUnitive® search soccer players x

Lucas Rodrigues Moura da Silva

PARIS SAINT-GERMAIN

NEWS TEAMS ASSOCIATION PSG TV COMMUNITY CLUB TICKETS SHOPPING FOUNDATION

Lucas Rodrigues Moura da Silva

Right winger

Through balls
Key passes
Dribbling
Taking set-pieces
Passing
Crossing
Holding on to the ball
Finishing

Likes to dribble
Likes to play short passes
Likes to do layoffs
Gets fouled often

PARIS SAINT-GERMAIN

Flu Emirates

REÇONS PLUS GRAND

Skills	11/12	12/13	13/14	14/15
Attacking				
- Goals	5	7	7	8
- Assist	3	5	6	7
Creative				
- Passes per game	30,7	31,2	29,5	32,6
- % Success in passes	81,3	85,7	84,2	86,5
Defensive				
- Tackles per game	0,8	1,4	1,0	1,2
- % Success in tackles	29,2	32,3	35,6	41,3
Physical				
- Sprint speed - km/h	29,1	29,4	29,5	29,9
- Sprints per game	32,3	30,8	33,2	32,6
- Strength	--	--	--	--

Injuries

14/15 Hamstring
10 games missed

Groin strain
7 games missed

13/14 Ankle
4 games missed

12/13 Adductor
9 games missed

Flu Emirates

REÇONS PLUS GRAND

Flu Emirates

Dribbling
Through balls
Key passes
Blocking the ball
Concentration
Aerial Duels
Discipline

Likes to do layoffs
Likes to tackle
Commits fouls often

PARIS SAINT-GERMAIN

Flu Emirates

REÇONS PLUS GRAND

Flu Emirates

REÇONS PLUS GRAND

It can be used for any kind of interaction component



Filter

Nation

- ☐ Spain
- ☐ France
- ☐ Brazil
- ☐ Germany
- ☐ Argentina

League

- ☐ Barclays PL
- ☐ Liga BBVA
- ☐ Bundesliga
- ☐ Serie A
- ☒ Ligue 1

Position

- ☐ All Position
- ☐ Attackers
- ☐ Midfielders
- ☐ Defenders
- ☐ Goalkeepers

Club

- ☒ PSG
- ☐ AS Monaco
- ☐ Olympique Lyon
- ☐ Marseille
- ☐ Toulouse FC

Goals

from to

Assist

from to

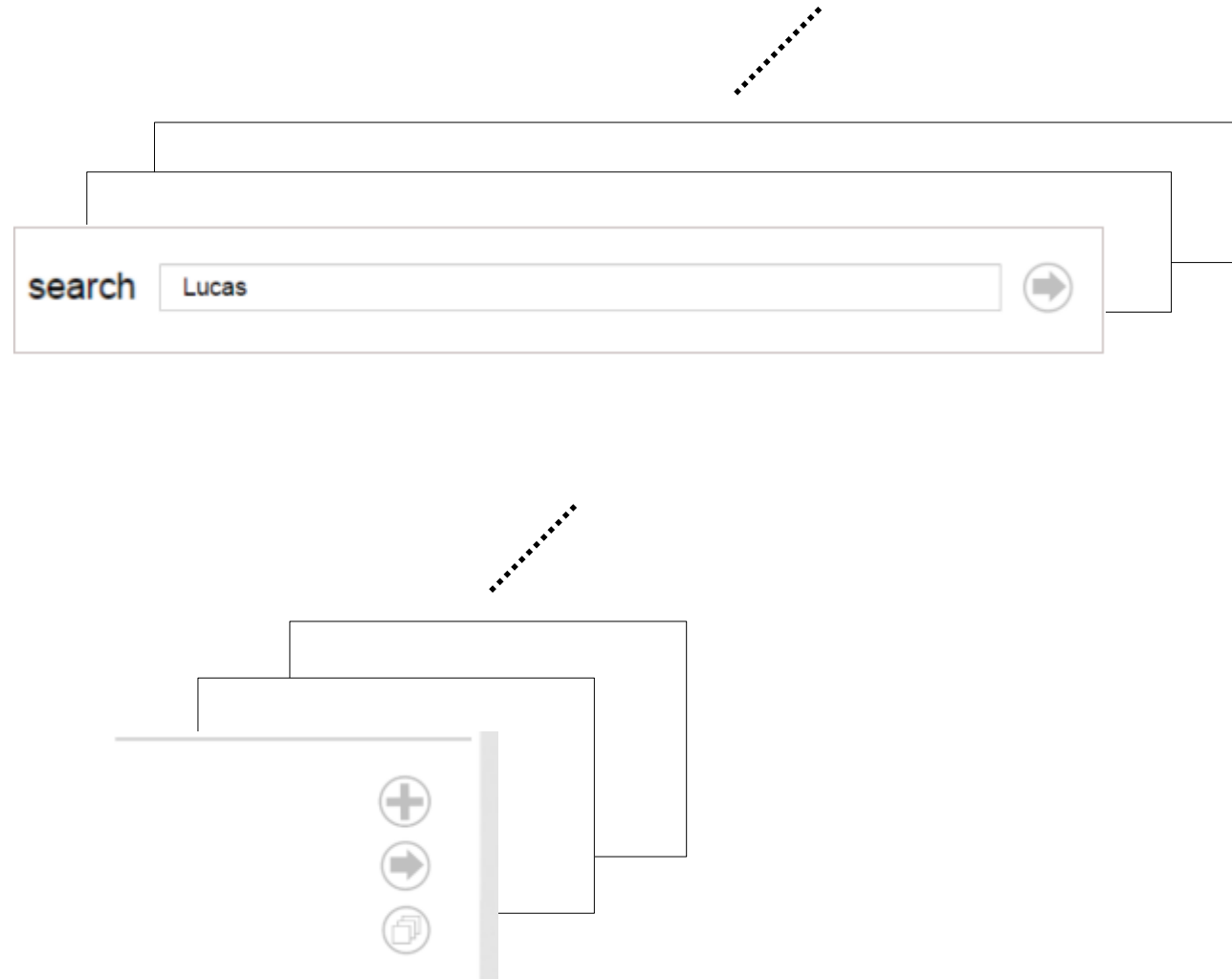
Age

from to

Height

from to

apply



search Lucas

+

→

📄

Sharing / Reuse Requires

- A **standard way** of describing for which data an interaction unit can be used
 - Linked data – requires vocabulary – a kind of data contract
- A **standard way** a unit can be retrieved
 - http request
- A **standard interface** to the unit once loaded
 - Functions to call
 - What data to supply (Uri's or data object model)
- A **standard way** to write data for optimizer feedback loop
- Libraries supporting such **standard functionalities**

But we need to **experiment first** before we can make great standards

**The way of the web
is open solutions based on standards**

**That is our exactly
what we propose for user interaction**

Our Solution: Open Linked Interaction

- ☑ Can give user full access to Linked Data
- ☑ Can offer a well designed and organized user interface
- ☑ Supports personalization
- ☑ Allows sharing / reuse

More information?



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Contact me!